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用能量法研究双模量大挠度圆板的轴对称弯曲

Large deflection axisymmetric bending of bi-modulous circular plate with energy method

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中文关键词： 双模量 大挠度 圆板 轴对称 弯曲

英文关键词:bi-modulous large deflection circular plate axisymmetric bending

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作者	单位	E-mail
吴晓	湖南文理学院,常德 415000	wx2005220@163.com
杨立军	湖南文理学院,常德 415000	
黄翀	湖南文理学院,常德 415000	
孙晋	湖南文理学院,常德 415000	

中文摘要:

双模量圆板在外载荷作用下发生轴对称弯曲变形时,会形成各向同性的拉伸区和压缩区。此种情况下,可把双模量圆板看成两种各向同性材料组成的层合板,采用弹性理论建立了双模量圆板在外载荷作用下的静力平衡方程,利用静力平衡方程确定了双模量圆板的中性面位置。在此基础上,采用能量法研究了双模量大挠度圆板轴对称弯曲变形问题,将该方法计算结果与有限元计算结果进行比较,说明了该计算方法是可靠的。算例分析表明,当圆板材料拉压弹性模量相差较大时,其挠度计算不宜采用相同弹性模量经典板壳理论,而应该采用双模量板壳理论的结论。

英文摘要:

Bi-modulous circular plate could form isotropic compression and tensile area under external loads as axisymmetric bending. Then the bi-modulous circular plate was regarded as laminated plate composited of two kinds of is otropic material. Static equilibrium equation of bi-modulous circular plate under external loads was established by using elastic theory. The location of neutral plane in bi-modulous circular plate was determined by the utilization of static equilibrium equation. It was studied with energy method that the large deflection axisymmetric bending of bi-modulous circular plate. And the calculation results were compared with that obtained by finite element method, and it shows that the method above is reliable. Numerical examples show that the deflection calculation of circular plate which has larger difference between tensile elastic modulus and compressive elastic modulus may as well not apply classical elastic theory with the same elastic modulus, and should use bi-modulous thin plate theory.

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